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EXAMINER	
GUARINO, RAHEL	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/594,640	Applicant(s) SALEM ET AL.	
	Examiner RAHEL GUARINO	Art Unit 2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 September 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-17 and 24-40* is/are pending in the application.

4a) Of the above claim(s) *18-23 and 41-45* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8,12-17,24-31,35-40* is/are rejected.

7)☒ Claim(s) *9-11 and 32-34* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

2. Claims 1-8,12-16,24-31,35-39 are rejected under 35 U.S.C. 102(a) as being anticipated by Waheed et al. "IEEE 2003, "Natural Gradient based Blind Multi User Detection in QPSK DS-CDMA Systems"

Re claim 1, Waheed discloses a natural gradient Blind Multi User Detection (BMUD) network system that adaptively estimates a set of matrices to counter a linear convolutive environment model r_n, the system comprising *(fg.1):*

an input receptive of at least one of the linear convolutive environment model r_n or a whitened version r_n^w of the linear convolutive environment model r_n *(page 1863, section II. "Downlink receiver signal model", right column, second paragraph, where the convolutive model of the n^{th} received symbol is expressed in equation 5 and equation 11 shows whitened version r_n^w);*

parametric matrices W_0 and W_k (k=1,2, . . . K) adaptable *(fig. 3 show the matrices W_0 and W_k, where K=1..k)* to estimate independent user symbols y_n at an n^{th} instant based on at least one of the linear convolutive environment model r_n or the whitened

version $r_n{}^{w}$ (*equation 11, where the received data at n*th *sampling instant)* of the linear convolutive environment mo del r_n *(equation 12 is the estimated output at n^{th} sampling instant);* and

a decision stage interpreting y_n and estimating corresponding user symbol estimates b_n^ also at the n^{th} instant (page *1866,"A simulation setup", left column, paragraph, equation 29; final symbol decision).*

Re claim 2, the system of claim 1, wherein the system is networked in a feedforward configuration *(fig.3; page 1864, section 2, "feedfoward BMUD configuration").*

Re claim 3, the system of claim 2, further comprising a recovery stage adapted to compute y_n according to:

$y_n = W_0\ r_n{}^{W} + \sum_{K=1}{}^{k} W_k\, r^{W}{}_{n-k}$ *(page 1864, equation 12),*

where K is an estimate of a number of a previous symbols needed for computation of y_n, with K being greater than or equal to J=[max (τ_L))+1] *(page 1863, equation 4)*

Re claim 4, the system of claim 2, wherein the parametric matrices W_0 and W_k have update laws according to:

Δ W_0 varies-W_0 (I-Φ $(y_n)y_n{}^{H}$) W_0 *(page 1864, equation 13);* and

Δ W_k varies- (I-Φ $(y_n)y_n{}^{H}$) W_k - Φ $(y_n)(r\ {}^{w}{}_{n-k})^{H}$ (page *1865, equation 14).*

where $\Phi(\cdot)$ is an element-wise acting score function, I is a K-d identity matrix, and k=1,2, . . . K, *(page 1865, section 1,"feedback BMUD configuration" left column)*

Re claim 5, the system of claim 2, wherein W_0 is initially chosen to be at least

one of an identity or a diagonally dominantly matrix, while all other matrices W_k are initialized to have at least one of random elements with a very small variance or as matrices of all zeros (page *1865, section 2,"feedfoward BMUD configuration", left column, first paragraph).*

Re claim 6, the system of claim 1, wherein the system is networked in a feedback configuration (page *1865, section 1,"feedback BMUD configuration").*

Re claim 7, the system of claim 6, wherein the recovery stage is adapted to compute y_n according to: $y_n = W_0^{-1} (r_n^{w} - \sum_{k=1}^{K} W_k y_{n-k})$

(page *1865, section 1,"feedback BMUD configuration" and equation 15).*

Re claim 8, the system of claim 6, wherein the parametric matrices W_0 and W_k have update laws according to:

ΔW_0 varies-$W_0 (I-\Phi(y_n)y_n^H)$ (page *1865, equation 16)*; and

ΔW_kvaries $W_0 (\Phi(y_n)y_{n-k}^H)$ *(page 1865, equation 17),*

where $\Phi(\cdot)$ is an element-wise acting score function, I is a K-d identity matrix, and k=1,2, . . . K, with K being an estimate of a number of previous symbols needed for computation of the parametric matrices *(page 1865, section 1,"feedback BMUD configuration" left column)*;K being greater than or equal to J:=integer [max (τ_L)]+1) *(page 1863, equation 4)*

Re claim 12, the system of claim 1, further comprising a whitening filter preprocessing received data for dimension reduction to K, which is an actual number of principal independent symbol sequences in the received data, and to remove second order dependence among received data samples and additive noise (page *1864,*

section III, "natural gradient blind multi-user detection (BMUD) algorithms", left column, second paragraph lines 5-11).

Re claim 13, the system of claim 12, wherein the whitening filter whitens data online using adaptive principle component analysis computational techniques (page *1864, section III,"natural gradient blind multi-user detection (BMUD) algorithms", left column, second paragraph lines 11-15)*

Re claim 14, the system of claim 13, wherein the whitening filter whitens data using an algebraic PCA estimate over a large batch of received data including N samples according to:

$R= [r_{1,} r_2 \dots r_{n-1,} r_n]$ (page *1864, section III,"natural gradient blind multi-user detection (BMUD) algorithms", right column, line 1)*

with a data correlation matrix $A_c=1/N-1 (RR^T)$ (page *1864, section III,"natural gradient blind multi-user detection (BMUD) algorithms", equation 10)*

Re claim 15. The system of claim 14, wherein the filter achieves the whitening using a filtering matrix according to:

$W=D^{-1/2} V^T$, where D represents a K-dim matrix of principle eigenvalues of the data correlation matrix A_c , and V represents a KxN matrix of principle eigen vectors of the data correlation matrix A_c, with K representing a number of users. (*page 1864, section III,"natural gradient blind multi-user detection (BMUD) algorithms", right column, line 1-10)*

Re claim 16, the system of claim 12, wherein the filter is adapted to calculate the whitened version r_n^w of the linear convolutive environment model r_n according to:

$r_n^w = W(H_0 b_n + H_1 b_{.n-1} + n_n) \equiv \bar{H}_0 b_n + \bar{H}_1 b_{n-1}$, (page *1864, equation 11).*

and the linear convolutive environment model r.sub.n is represented according to:

$r_n = H_0 b_n + H_1 b_{n-1} + n_n$ (page *1864, equation 7)*

where b_n and b_{n-1} are the K-d vectors of current and previous symbols for all the K users, H.sub.0 and H.sub.1 are KxK mixing matrices with the structure

$H_0 = [H_{0.0}\ H_{0.1}\ \ldots.\ H_{0.k}]$, $H_1 = [H_{1.0}\ H_{1.1}\ \ldots.\ H_{1.k}]$, such that

$H_{0.k} = \sqrt{\varepsilon_0} \sum_{l=0}^{l-1} h_1 \bar{z}_{kl}$, $H_{1.k} = \sqrt{\varepsilon_1} \sum_{l=0}^{l-1} h_1 \text{ - } \bar{\underline{\ }}_{kl}$ and $\varepsilon_0, \varepsilon_1$ represent the energy of the current and the previous symbol respectively (page *1864, section III,natural gradient blind multi-user detection (BMUD) algorithms, left Column from line 1-12)*

Re claim 24, <u>Waheed</u> discloses a natural gradient Blind Multi User Detection (BMUD) method that adaptively estimates a set of matrices to counter a linear convolutive environment model r_n, comprising *(fg.1):*

receiving at least one of the outputs of the linear convolutive environment model r_n or a whitened version r_n^w of the outputs of the linear convolutive environment model r_n *(page 1863, section II. "Downlink receiver signal model", right column, second paragraph, where the convolutive model of the n^{th} received symbol is expressed in equation 5 and equation 11 shows whitened version $r_n^{w)}$*

Adapting parametric matrices W_0 and W_k (k=1,2, . . . K) *(fig. 3 show the matrices W_0 and W_k , where K=1..k)* to estimate independent user symbols y_n at an n^{th} instant based on at least one of the linear convolutive environment model r_n or the whitened version $r_n{}^w$ (*equation 11, where the received data at n*th *sampling instant)* of the linear

convolutive environment mo del r_n *(equation 12 is the estimated output at n^{th} sampling instant);* and

interpreting y_n and estimating corresponding user symbol estimates b_n^ also at the n^{th} instant (page *1866,"A simulation setup", left column, paragraph, equation 29; final symbol decision).*

Re claim 25, the method of claim 24, further comprising employing a feedforward network configuration *(fig.3; page 1864, section 2, feedfoward BMUD configuration).*

Re claim 26, the method of claim 25, further comprising computing y_n according to:

$y_n = W_0\ r_n^w + \sum_{K=1}^{k} W_k\, r_{n-k}^w$ *(page 1864, equation 12).*

Re claim 27, the method of claim 25, further comprising updating the parametric matrices W_0 and W_k via update laws according to:

$\Delta\ W_0$ varies-$W_0\,(I-\Phi\ (y_n)y_n^H)\ W_0$ (page *1864, equation 13);* and

$\Delta\ W_k$ varies- $(I-\Phi\ (y_n)y_n^H)\ W_k\ -\ \Phi\ (y_n)(r^{w}_{n-k})^H$ (page *1865, equation 14).*

where $\Phi(\cdot)$ is an element-wise acting score function, I is a K-d identity matrix, and k=1,2, . . . K *(page 1865, section 1,"feedback BMUD configuration" left column)*

Re claim 28, the method of claim 25, further comprising;

initializing W_0 to be at least one of an identity or a diagonally dominantly matrix, and initializing all other matrices W_k are initialized to have at least one of random elements with a very small variance or as matrices of all zeros (page *1865, section 2,"feedfoward BMUD configuration", left column, first paragraph).*

Re claim 29, the method of claim 24, further comprising employing a feedback

network configuration (page *1865, section 1," feedback BMUD configuration")*.

Re claim 30, the method of claim 29, further comprising computing y_n according to: $y_n = W_0^{-1} (r_n^{w} - \sum_{k=1}^{K} W_k y_{n-k})$

(page *1865, section 1,"feedback BMUD configuration" and equation 15)*.

Re claim 31, the method of claim 29, updating the parametric matrices W_0 and W_k via update laws according to:

ΔW_0 varies-$W_0 (I-\Phi(y_n)y_n^H)$ (page *1865, equation 16)*; and

ΔW_kvaries $W_0 (\Phi(y_n)y_{n-k}^H)$ *(page 1865, equation 17),*

where $\Phi(\cdot)$ is an element-wise acting score function, I is a K-d identity matrix, and k=1,2, . . . K, *(page 1865, section 1,"feedback BMUD configuration" left column)*

Re claim 35, the method of claim 24, further comprising preprocessing received data for dimension reduction to K, which is an actual number of principal independent symbol sequences in the received data, and to remove second order dependence among received data samples and additive noise (page *1864, section III," natural gradient blind multi-user detection (BMUD) algorithms", right column, second paragraph lines 5-11)*.

Re claim 36, the method of claim 35, further comprising whitening data online using adaptive principle component analysis computational techniques (page *1864, section III,natural gradient blind multi-user detection (BMUD) algorithms, right column, second paragraph lines 11-15)*.

Re claim 37, the method of claim 36, further comprising whitening data using an

algebraic PCA estimate over a large batch of received data including N samples according to:

$R= [r_{1,} r_2 \ldots r_{n-1,} r_n]$ (page *1864, section III,"natural gradient blind multi-user detection (BMUD) algorithms", right column, line 1)*

with a data correlation matrix A_c=1/N-1 (RR^T) (page *1864, section III,"natural gradient blind multi-user detection (BMUD) algorithms", equation 10)*

Re claim 38, the method of claim 36, further comprising employing a filtering matrix according to:

$W=D^{-1/2} V^T$, where D represents a K-dim matrix of principle eigenvalues of the data correlation matrix A_c , and V represents a KxN matrix of principle eigen vectors of the data correlation matrix A_c, with K representing a number of users. (*page 1864, section III,"natural gradient blind multi-user detection (BMUD) algorithms", right column, line 1-10)*

Re claim 39, the method of claim 35, further comprising calculating the whitened version r_n^W of the linear convolutive environment model r_n according to:

$r_n^W = W (H_0 b_n + H_1 b._{n-1} + n_n) \equiv \bar{H}_0 b_n + \bar{H}_1 b_{n-1}$, (page *1864, equation 11).*

and the linear convolutive environment model r_n is represented according to:

$r_n = H_0 b_n + H_1 b_{n-1} + n_n$ (page *1864, equation 7)*

where b_n and b_{n-1} are the K-d vectors of current and previous symbols for all the K users, H.sub.0 and H.sub.1 are KxK mixing matrices with the structure

$H_0 = [H_{0.0}\ H_{0.1} \ldots H_{0.k}]$, $H_1 = [H_{1.0}\ H_{1.1} \ldots H_{1.k}]$, such that

$H_{0.k}=\sqrt{\varepsilon_0}\sum_{l=0}^{l-1} h_1 z^{-}{}_{kl}$, $H_{1.k}=\sqrt{\varepsilon_1}\sum_{l=0}^{l-1} h_1 \;\text{-}\; {}^{-}{}_{kl}$ and $\varepsilon_{0,}\varepsilon_1$ represent the energy of the current and the previous symbol respectively (page *1864, section III,"natural gradient blind multi-user detection (BMUD) algorithms", left Column from line 1-12)*

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> ((e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. **Claim 1 is rejected under 35 U.S.C. 102(e) as being anticipated by Massicotte et al. US 2004/0136444**

Re claim 1, Massicotte discloses a natural gradient Blind Multi User Detection (BMUD) network system that adaptively estimates a set of matrices to counter a linear convolutive environment model *($h_k^{(n)}$)* , the system comprising *(para#110 and fig.2):*

an input receptive *(r~(t))* of at least one of the linear convolutive environment model *($h_k^{(n)}$)* or a whitened version r_n^w of the linear convolutive environment model *($h_k^{(n)}$) (equation 3 and para#11);*

parametric matrices W_0 and W_k (k=1,2, . . . K) adaptable *(adaptive feedfoward*

(w_K $^{(n)}$) and feedback ($w_{DFK}$$^{(n)}$);para#70 lines 7-12 and the vector weights are defined according to equation 14; where i=1,2,...K) to estimate independent user symbols $y_k^{(n)}$ at an n^{th} instant based on at least one of the linear convolutive environment model*(h_k $^{(n)}$)* or the whitened version of the linear convolutive environment mo del *(h_k $^{(n)}$) (equation 17 is the estimated output of individual user, para#32);* and

a decision stage *(decision function)* interpreting $y_k^{(n)}$ and estimating corresponding user symbol estimates b_n^ also at the n^{th} instant *(equation 21 and para#93).*

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

6. Claims 17,40 are rejected under 35 U.S.C. 102(a) as being anticipated by Waheed et al. "IEEE International Conference on Robotics, Intelligent Systems and signal processing; Adaptive RAKE-Blind Source Recovery Algorithms for 3GPP UMTS/WCDMA Downlink Receivers"

Re claim 17, Waheed discloses an adaptive detector utilizing knowledge utilized by a RAKE receiver (page *634, section I, "introduction", right Column, third paragraph lines 1-6)*, comprising:

an adaptive weighting matrix *(adaptive weighting matrix of dimension G x G)* introduced into a RAKE structure (*page 637, section 3.4, "RAKE-blind source recovery (RAKE-BSR) and RAKE-principal component analysis (RAKE_PCA) detectors, left column, first paragraph),*

wherein the matrix is *(matrix A adaptively estimates using the updated laws (equation 10))* adaptively estimated using at least one of Principal Component Analysis (PCA) computational techniques *(for (PCA), the matrix=*$(I-y(k)y(k)^{H})\,A(k)$*)* and

static Blind Source Recovery (BSR) *(for (BSR/ICA), the matrix=*$(I-\Phi(y(k))y(k)^{H})\,A(k)$*)* computational techniques (*page 637, section 3.4, "RAKE-blind source recovery (RAKE-BSR) and RAKE-principal component analysis (RAKE_PCA) detectors, right columns).*

Re claim 40*,* Waheed discloses adaptive detection method (page *634, section I, "introduction", right Column, third paragraph lines 1-6),* comprising:

introducing an adaptive weighting matrix *(adaptive weighting matrix of dimension G x G)* into a RAKE structure (*page 637, section 3.4, "RAKE-blind source recovery (RAKE-BSR) and RAKE-principal component analysis (RAKE_PCA) detectors, left column, first paragraph),*

wherein the matrix is *(matrix A adaptively estimates using the updated laws (equation 10))* adaptively estimated using at least one of Principal Component Analysis (PCA) computational techniques *(for (PCA), the matrix=$(I\text{-}y(k)y(k)^{H})\ A(k)$)* or static Blind Source Recovery (BSR) *(for (BSR/ICA), the matrix=$(I\text{-}\ \Phi(y(k))y(k)^{H})\ A(k)$;where the Blind Source Recovery (BSR) is based on Independent Component Analysis (ICA))* computational techniques based on Independent Component Analysis (ICA (*page 637, section 3.4, "RAKE-blind source recovery (RAKE-BSR) and RAKE-principal component analysis (RAKE_PCA) detectors, right columns).*

Allowable Subject Matter

7. Claims 9-11, 32-34 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to RAHEL GUARINO whose telephone number is (571)270-1198. The examiner can normally be reached on M-F (9-5:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Payne can be reached on 571-272-3024. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Rahel Guarino/
Examiner, Art Unit 2611

/David C. Payne/
Supervisory Patent Examiner, Art Unit 2611